CHAPTER 1: CHINOOK SALMON STATUS AND ESCAPEMENT GOALS FOR STOCKS IN SOUTHEAST ALASKA

by

Scott McPherson

David Bernard

John H. Clark

Keith Pahlke

Edgar Jones

John Der Hovanisian

Jan Weller

Christie Hendrich

and

Randy Ericksen

ABOUT THE AUTHORS

Scott McPherson is a fisheries scientist, Keith Pahlke, Edgar Jones, John Der Hovanisian are fisheries biologists, and Christie Hendrich is a fisheries technician with the ADF&G Division of Sport Fish in Douglas, 802 Third Street, P.O. Box 240020, Douglas, AK 99824-0020.

Dave Bernard is a fisheries scientist with the ADF&G Division of Sport Fish in Anchorage, 333 Raspberry Road, Anchorage, AK 99518-1599.

John H. Clark is the Chief Fisheries Scientist with the Division of Commercial Fisheries Headquarters in Juneau, P.O. Box 25526, Juneau AK 99802-5526.

Jan Weller is a fisheries biologist with the ADF&G Division of Sport Fish in Ketchikan, 2030 Sea Level Drive, Suite 205, Ketchikan, AK 99901.

Randy Ericksen is a fisheries biologist with the ADF&G Division of Sport Fish in Haines, Mile 1 Haines highway, P.O. Box 330, Haines, AK 99827-0330.

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ABSTRACT

Chinook salmon *Oncorhynchus tshawytscha* escapements in 11 drainages were evaluated for trends and tracking in relationship to *biological escapement goals* that have been developed for each system, and all are judged to be healthy. Escapement goals for the Unuk, Blossom and Keta river stocks are being updated; results of these analyses will be available prior to the 2006 Board of Fisheries meeting on Southeast Alaska finfish. Methods for determining these three escapement goals are described, and reports containing the detailed analyses for all 11 stocks are cited.

Key words: Chinook salmon, *Oncorhynchus tshawytscha*, escapement, escapement goals, escapement goal ranges, stock status, Taku River, Stikine River, Alsek River, Chilkat River, Unuk River, Chickamin River, Blossom River, Keta River, King Salmon River, Situk River, Andrew Creek, U.S./Canada Pacific Salmon Treaty, transboundary rivers

INTRODUCTION

Chinook salmon (*Oncorhynchus tshawytscha*) in Southeast Alaska are harvested primarily by the commercial troll fleet and recreational anglers. Chinook salmon are also harvested incidentally in U.S. commercial set gillnet, drift gillnet, and purse seine fisheries, and in subsistence fisheries in the region. In addition, Chinook salmon are harvested in Canada in the transboundary Alsek, Taku and Stikine rivers. Management of Chinook fisheries in Southeast Alaska is described in other Alaska Board of Fisheries documents, presentations and regional management plans.

Harvests of Chinook salmon in Southeast Alaska commercial and recreational fisheries are managed on an abundance-based approach, with an annual all-gear harvest target provided by the Pacific Salmon Commission, via its Chinook Technical Committee, prior to each fishing season. The annual Pacific Salmon Commission harvest target is based on a preseason forecast of the aggregate abundance of all Chinook salmon stocks that are present in Southeast Alaska for the coming year (PSC CTC 2002). The preseason abundance is estimated from the Pacific Salmon Commission Chinook model run by the Chinook Technical Committee, with membership from Alaska, British Columbia, Washington, Oregon, and Idaho. Presently, the all-gear quota is allocated by the Alaska Board of Fisheries between commercial and recreational users as follows: (1) 8,600 Chinook salmon to the gillnet fleet; (2) 4.3% of the total to the purse seine fleet; (3) 80% of the remainder to the troll fleet; and (4) 20% of the remainder to the recreational fleet. Additionally, in February 2005, the U.S. and Canada reached a bilateral terminal harvest sharing agreement for directed Taku and Stikine river Chinook fisheries.

Chinook salmon harvests in Southeast Alaska are known to be composed of stocks originating from as far north as the Yakutat area to the southern coast of Oregon. This includes local Southeast Alaska and transboundary wild stocks. Chinook salmon are known to occur in 34 rivers in, or draining into, the Southeast region of Alaska from British Columbia or Yukon Territory, Canada, (Kissner 1977). Local Alaska hatchery stocks contribute a sizeable portion of Southeast Alaska Chinook harvests each year (Table 1.1).

STOCK STATUS

Stock status for Chinook salmon stocks in the Southeast region was judged primarily by performance in meeting escapement requirements; these are local wild stocks that contribute to harvests in Southeast Alaska fisheries. Harvest estimates are also presented for selected stocks. A detailed description of the stock assessment program was presented in the 2003 stock status report (Geiger and McPherson 2004) to provide an understanding of the tools that are available for management of these stocks, and performance in relationship to the principles and criteria in

the state's Sustainable Salmon Fisheries Policy (ADF&G and BOF *unpublished*; 5 AAC 39.222). We briefly summarize the assessment program below.

STOCK ASSESSMENT PROGRAM

In the mid-1970s it became apparent that many of the local Chinook salmon stocks in this region were depressed relative to historical levels of production (Kissner 1974). A fisheries management program was implemented to rebuild stocks in Southeast Alaska streams and in trans-boundary rivers (rivers that originate in Canada and flow into Southeast Alaska coastal waters; ADF&G *unpublished*). Initially, under this management program, commercial and recreational fisheries in terminal and near-terminal areas in U.S. waters were closed. The troll fishery was also modified extensively by 1982 to reduce exploitation on local wild stocks and later to target Alaska hatchery stocks. In 1985, the Alaskan program was incorporated into a comprehensive, coastwide rebuilding program for all wild stocks of Chinook salmon, under the auspices of the U.S./Canada Pacific Salmon Treaty. In 1999, the Pacific Salmon Treaty was re-signed after extensive negotiations. The Chinook chapter of the new agreement specified coastwide, abundance-based management of Chinook salmon stocks, and called for more comprehensive stock and fishery monitoring.

In the 1970s, a stock assessment program was developed to provide information for tools to manage Chinook stocks in the region, to judge stock status and develop sound escapement goals. This program has evolved and expanded over the past few decades, concurrent with increasing information needs. The major components of the stock assessment program in Southeast Alaska include estimation of escapement, survival, harvest, and exploitation rates and patterns. Programs are in place in 11 rivers (Figure 1.1) to sample, enumerate and collect biological data from the escapements. These rivers represent all of the region's major producers (production greater than 10,000 fish), seven medium producers (production of 1,500 to 10,000 fish), and one minor producer (production less than 1,500 fish). Separate programs are in place to sample, enumerate, and collect biological data from the fisheries that harvest Chinook salmon.

ESCAPEMENT PROGRAMS

Initially, the escapement estimation program consisted of peak survey counts (peak single-day aerial helicopter or foot counts) annually in ten of the 11 index systems and a weir on the Situk River. This was inadequate for intensive fishery management and population assessment, such as that now in place in the Pacific Salmon Commission forum. Over time the program was modified to estimate total escapement to all 11 systems (Table 1.2), including development of expansion factors relating survey counts to total escapement. Presently, total escapement programs are operated on many of the larger rivers, including the weirs on the Situk and Klukshu rivers, and mark-recapture tagging projects on the Chilkat, Taku, Stikine and Unuk rivers. Helicopter survey counts are used to monitor escapements to other systems. Radio telemetry projects have been conducted once or twice on all major systems to determine spawning distribution and to verify that survey counts were being conducted over the major spawning areas. Biological data collected has included age, sex, length, and tag recovery to estimate escapement in total and by sex and age, as well as the fraction of fish that were coded wire tagged in selected systems. Selected descriptions and results of the inriver stock assessment programs are contained in Appendix 1.

HARVEST PROGRAMS

Commercial harvests are reported on fish tickets and sport harvests are estimated by creel surveys. These provide estimates of the total harvest in a fishery, but not the stock composition. Harvests of specific stocks, including Alaskan hatchery fish, can be estimated using coded wire tags. Pacific Salmon Treaty agreements provide Alaska fisheries a special add-on of Alaskan hatchery Chinook salmon to the annual catch ceiling. Estimates of stock composition in Southeast Alaska fisheries that harvest Chinook salmon have been somewhat limited at present, the five largest stocks in Southeast Alaska are not included in the Chinook Technical Committee Chinook model in part because this information is not available. This is being addressed by two programs: coded wire tagging of wild Chinook stocks in the region and a genetic stock identification program. Fishery sampling of coded wire tags and genetic sampling has been increased in the past few years to improve our estimates of stock composition. Five wild stocks of Chinook salmon are being coded wire tagged at present in the region: the Chilkat, Taku, Stikine, Unuk and Chickamin River stocks. The combination of these two programs has improved, and will continue to further improve stock identification information available for Southeast Alaska Chinook catches in the near future.

STOCK STATUS ASSESSMENT

In this section, the status of wild Chinook stocks are evaluated through 2005. The Sustainable Salmon Fisheries Policy (ADF&G and BOF *unpublished*) specifies guidelines to manage salmon stocks for sustainability. Our stock assessment and management program for Chinook salmon in Southeast Alaska should provide a sustained resource, i.e., follow the Sustainable Salmon Fisheries Policy.

Escapement goals for the 11 index stocks of Chinook salmon have been established. These *biological escapement goal* ranges are designed to maintain wild stocks at high levels of productivity and yields near the theoretical average maximum sustained level. Management plans and regimes are structured for Southeast Alaska fisheries to achieve escapements within the *biological escapement goal* ranges wherever possible, and are developed with significant input from the public and users. Escapements have been evaluated in the 11 index stocks against the *biological escapement goal* ranges established for each stock to determine stock status. Escapements were assessed retrospectively back to 1975 as if the current *biological escapement goal* had been in place.

All 11 index stocks are judged to be healthy—estimated escapements have been within or above the escapement goal ranges for all 11 stocks the past two years, and for majority of stocks in all years during the past two decades (Table 1.3 and Figures 1.2, 1.3, and 1.4). Escapement goals for the Unuk, Blossom and Keta rivers are being revised, but revisions are not expected to change this general assessment.

ESCAPEMENT GOALS

At the 2003 Alaska Board of Fisheries meeting for Southeast Region finfish, it was reported that *biological escapement goal* ranges had been established or updated for 11 Chinook index systems in Southeast Alaska. Since that time, we have been revising escapement goals for the Unuk, Blossom and Keta river stocks. In this section, we provide a brief history of the escapement goals for these three stocks, and a brief discussion of the detailed analyses we are using to develop new goals. In Appendix 1, a section is included for each of the 11 stocks, which briefly describes the stock and fisheries that harvest it, key stock assessment data, and the current escapement goal.

Table 1.1–Southeast Alaska Chinook salmon harvest levels and Alaska hatchery contributions in Southeast Alaska harvests, from 1965 to 2004, in thousands of Chinook salmon (2004 data and some recent harvests subject to revision)[a].

Year	Commercial harvest	Sport harvest	Total all gear Southeast Alaska harvest	Alaska hatchery contribution	Southeast Alaska harvest minus AK hatchery contribution
1965	337	13	350	0	350
1966	308	13	321	0	321
1967	301	13	314	0	314
1968	331	14	345	0	345
1969	314	14	328	0	328
1970	323	14	337	0	337
1971	334	15	349	0	349
1972	286	15	301	0	301
1973	344	16	360	0	360
1974	346	17	363	0	363
1975	301	17	318	0	318
1976	242	17	259	0	259
1977	285	17	302	0	302
1978	401	17	416	0	418
1979	366	17	383	0	383
1980	324	20	344	6	338
1981	268	21	289	2	287
1982	289	26	315	1	314
1983	290	22	312	3	309
1984	268	22	290	6	284
1985	250	25	275	13	262
1986	259	23	282	17	265
1987	258	24	282	24	258
1988	253	26	279	29	250
1989	260	31	291	29	262
1990	316	51	367	54	313
1991	299	60	359	70	289
1992	216	43	259	44	215
1993	255	49	304	40	264
1994	222	42	264	36	228
1995	186	50	236	69	167
1996	178	58	236	80	156
1997	271	72	343	53	289
1998	216	55	271	31	239
1999	179	72	251	55	196
2000	200	63	263	82	181
2001	194	72	266	85	180
2002	357	70	427	77	350
2003	331	49	380	66	314
2004	363	66	429	81	348

[a] Harvests statistics for 1975-2002 from Gaudet et al. (2004).
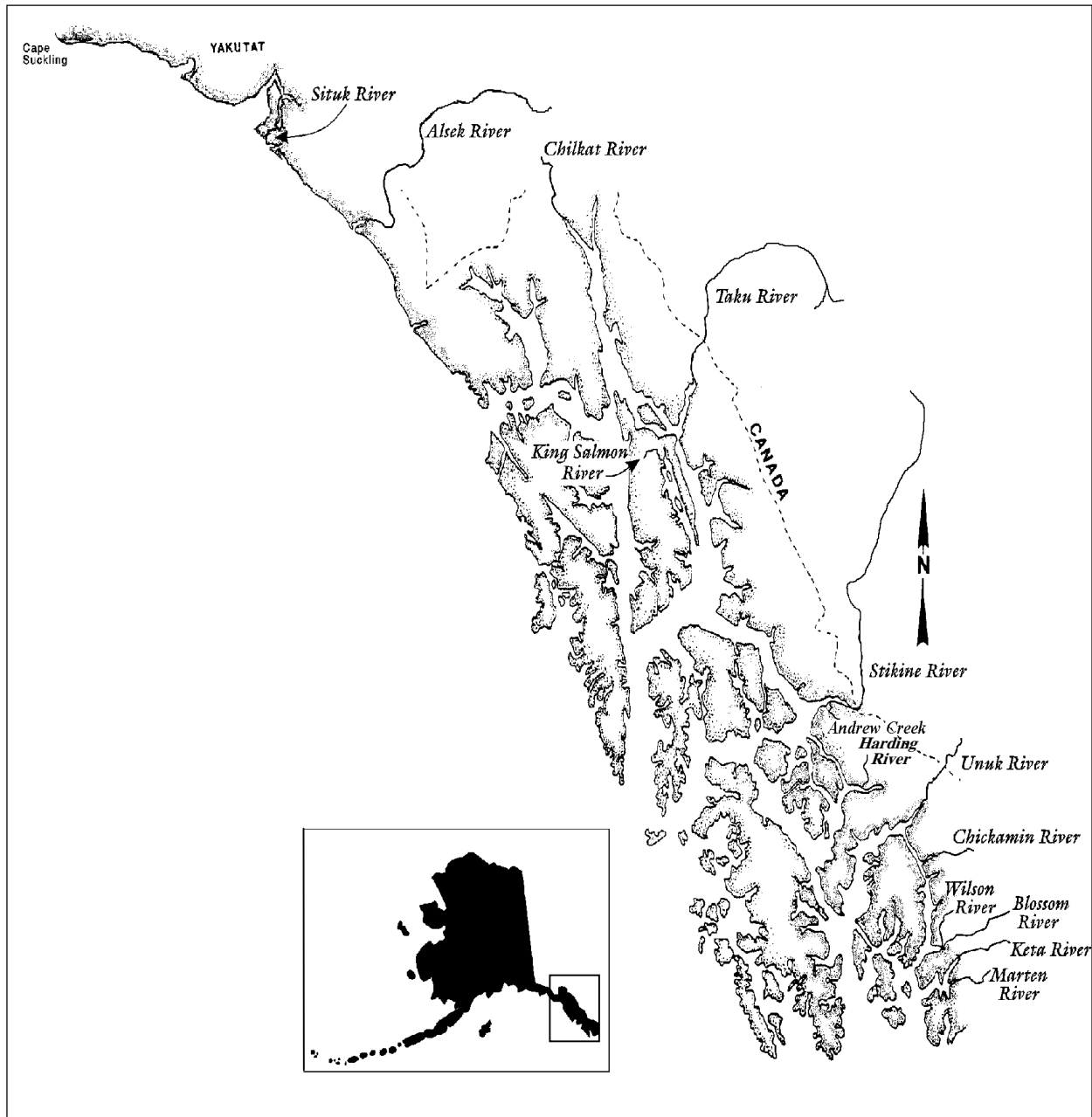
Figure 1.1–Location of selected Chinook salmon systems in Southeast Alaska, Yakutat, and transboundary rivers.

UNUK RIVER

In 1981 the ADF&G escapement goal was 1,800 large index spawners. This goal was mistakenly based on a 1978 count thought to be 1,765 fish, which was revised downward in 1985 to 1,106 fish upon discovery that some tributary counts were entered twice. The corrected count was still the largest pre-1981 index count. In 1994, ADF&G revised the goal to 875 large index spawners,

Table 1.2–Estimated total escapements of Chinook salmon to escapement indicator systems and to Southeast Alaska and transboundary rivers, from 1975 to 2005. (2005 data and some recent estimates are subject to revision). Numbers in bold type are weir counts or mark–recapture total estimates.

Year	MAJOR SYSTEMS Alsek (Klukshu)[a]	Taku	Stikine	MEDIUM SYSTEMS Situk	Chilkat	Andrew	Unuk[a]	Chickamin[a]	Blossom[a]	Keta[a]	Minor King Salmon	Total[b]
1975		12,920	7,571			520		1,717	584	609	63	NA
1976	5,267	24,582	5,723	**1,421**		**404**		727	272	252	98	43,350
1977	13,355	29,496	11,445	**1,732**		**456**	4,706	1,682	448	690	201	67,193
1978	12,524	17,124	6,835	**808**		**388**	5,344	1,431	572	1,176	86	48,408
1979	15,365	21,617	12,610	**1,284**		**327**	2,783	1,107	216	1,278	132	59,365
1980	12,311	39,239	30,573	**905**		**282**	4,909	2,063	356	576	105	95,582
1981	9,717	49,559	36,057	**702**		**536**	3,532	1,782	636	987	152	108,510
1982	9,747	23,848	40,488	**434**		**672**	6,528	2,649	1,380	2,262	389	92,468
1983	11,073	9,794	6,424	**592**		**366**	5,436	2,781	2,356	2,466	**245**	43,380
1984	7,781	20,778	13,995	**1,726**		**389**	8,876	5,113	2,032	1,830	**265**	65,602
1985	6,351	35,916	16,037	**1,521**		638	5,721	4,436	2,836	1,872	**175**	78,937
1986	12,905	38,111	14,889	**2,067**		1,414	10,273	8,097	5,112	2,070	**255**	99,457
1987	12,330	28,935	24,632	**1,379**		1,576	9,533	4,524	5,396	2,304	**196**	94,880
1988	9,870	44,524	37,554	**868**		1,128	8,437	3,647	1,536	1,725	**208**	114,547
1989	10,900	**40,329**	24,282	**637**		1,060	5,552	4,334	1,376	3,465	**240**	96,417
1990	8,405	**52,142**	22,619	**628**		1,328	2,856	2,617	1,028	1,818	**179**	97,985
1991	11,004	51,645	23,206	**889**	**5,897**	800	3,165	2,260	956	816	**134**	100,770
1992	6,153	55,889	34,129	**1,595**	**5,284**	1,556	4,223	1,605	600	651	**99**	111,783
1993	15,944	66,125	58,962	**952**	**4,472**	2,120	5,160	1,805	1,212	1,086	263	158,099
1994	17,919	48,368	33,094	**1,271**	**6,795**	1,144	3,435	1,800	644	918	210	116,786
1995	26,715	**33,805**	16,784	**4,330**	**3,790**	686	3,730	**2,309**	868	525	146	93,686
1996	16,741	**79,019**	**28,949**	**1,800**	**4,920**	670	5,639	**1,587**	880	891	288	141,382
1997	14,004	**114,938**	**26,996**	**1,878**	**8,100**	586	**2,970**	1,262	528	738	357	172,357
1998	**4,621**	31,039	**25,968**	**924**	**3,675**	974	**4,132**	1,814	**364**	**446**	132	74,089
1999	**11,597**	**19,734**	**19,947**	**1,461**	**2,271**	1,210	**3,914**	2,283	848	**968**	300	64,533
2000	**8,295**	**30,529**	**27,531**	**1,785**	**2,035**	1,380	**5,872**	3,717	924	**913**	137	83,117
2001	**11,022**	**42,980**	**63,523**	656	**4,517**	2,108	**10,541**	**5,177**	816	1,029	147	142,516
2002	**8,504**	**52,409**	**50,875**	**1,000**	**4,051**	1,752	**6,988**	**5,007**	896	1,233	153	132,868
2003	**4,932**	**36,435**	**46,824**	**2,117**	**5,657**	1,190	**5,546**	**4,579**	812	966	117	109,195
2004	**7,343**	**69,199**	**48,900**	757	**3,422**	3,068	**3,963**	**3,275**	**734**	1,128	134	141,923
2005	5,297	**36,671**	38,043	**613**	**3,470**	2,030	4,489	4,287	**912**	1,491	141	97,444

[a] Escapements for the four Behm Canal systems are shown here for total escapement, to provide comparisons of magnitude across systems. Escapement goals for these four systems are for survey counts at present and are shown in Table 1.3 and Figure 1.4. Likewise, the escapement goal for the Alsek River is 1,100 to 2,300 Chinook salmon past the Klukshu River weir, which represents approximately 20% of the Chinook salmon production in the Alsek River.

[b] Total includes the estimated totals of large spawning Chinook across all 11 systems. Escapements for the Chilkat River were approximated from 1976 to 1990 to make the totals comparable across years.

Table 1.3–Estimated biological escapement goal ranges for 11 Chinook salmon stocks in Southeast Alaska. These biological escapement goals include large spawners of approximate legal retention size (28 inches total length) and do not include smaller 1- and 2-ocean-age males.

	Chinook salmon stock	*Biological escapement goal* range for large spawners in survey count	2001–2005 survey count average	Present survey expansion factor	*Biological escapement goals* range for large spawners estimated in total escapement	2001–2005 total escapement average
1	Chilkat River [a]	NA	NA	NA	1,750-3,500	4,223
2	King Salmon River [b]	80–160	92	1.50	120–240	138
3	Andrew Creek [b]	375–750	1,015	2.00	650–1,500	2,030
4	Blossom River [b]	250–500	282	4.00	NA	834
5	Keta River [b]	250–500	390	3.00		1,169
6	Unuk River [b]	650–1,400	1,195	4.83		6,305
7	Chickamin River [b]	450–900	942	4.64		4,465
8	Situk River [c]	NA	NA	NA	450–1,050	1,029
9	Klukshu (Alsek) River [d]	1,100–2,300	1,827	4.95		7,420
10	Taku River [d]	5,800–10,600	6,346	5.20	30,000–55,000	47,339
11	Stikine River [d]	2,700–5,300	9,674	5.15	14,000–28,000	49,633

[a] The above *biological escapement goal* range has been approved by review teams from ADF&G and the Chinook Technical Committee of the Pacific Salmon Commission.

[b] The above *biological escapement goal* ranges have been approved by review teams from ADF&G and the Chinook Technical Committee of the Pacific Salmon Commission. *Biological escapement goals* for the Blossom, Keta, Unuk and Chickamin rivers are expressed as survey count goals. Escapement goals for the Unuk, Blossom, and Keta rivers are being revised and will be available for review by the Alaska Board of Fisheries by January 2006.

[c] The above *biological escapement goal range* has been approved by review teams from ADF&G.

[d] The above *biological escapement goal* ranges for the three transboundary rivers have been approved by review teams from ADF&G, the Department of Fisheries and Oceans Canada, and the Chinook and Transboundary Technical Committees of the Pacific Salmon Commission.
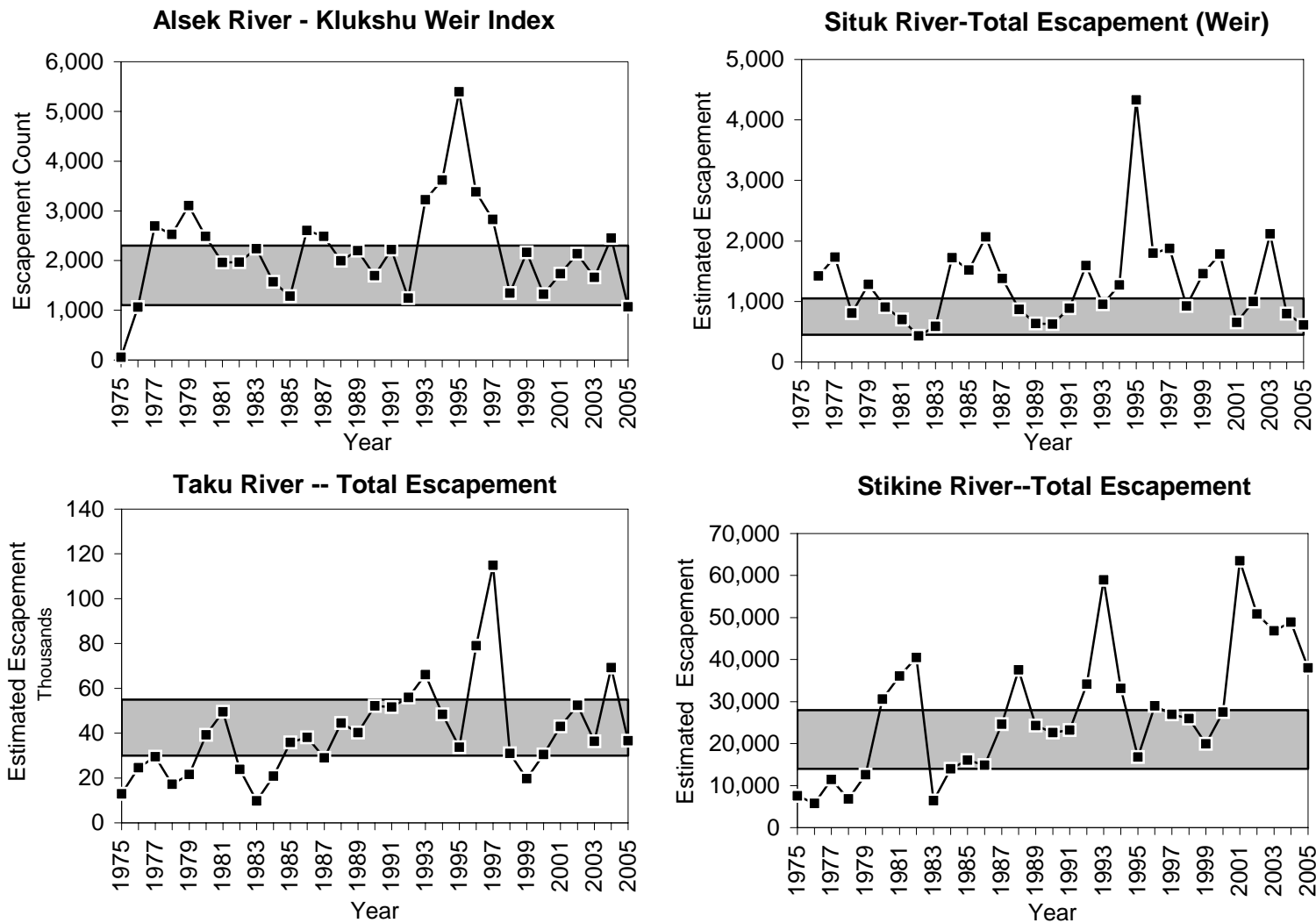
Figure 1.2–Estimated escapements of Chinook salmon in the Alsek, Situk, Taku, and Stikine rivers from 1975 to 2005. All values represent the total escapement of large (3- to 5-ocean-age) Chinook salmon except in the Alsek, which are total escapements past Klukshu weir, an index for the Alsek River.

Chilkat River--Total Escapement

King Salmon River--Total Escapement

Andrew Creek--Total Escapement
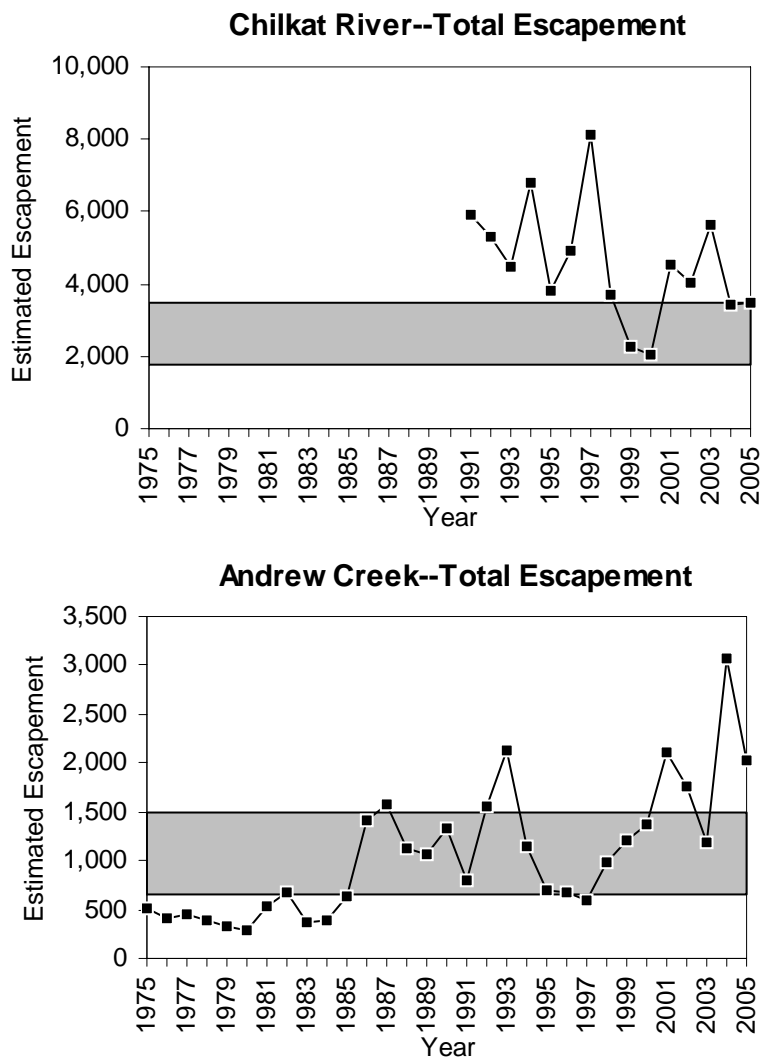
Figure 1.3–Estimated escapements of Chinook salmon in the Chilkat and King Salmon rivers and in Andrew Creek from 1975 to 2005. All values represent the total escapement of large (3- to 5-ocean-age) Chinook salmon.

Unuk River -- Foot/Aerial Helicopter Index

Chickamin River -- Aerial Helicopter Index

Blossom River -- Aerial Helicopter Index

Keta River -- Aerial Helicopter Index
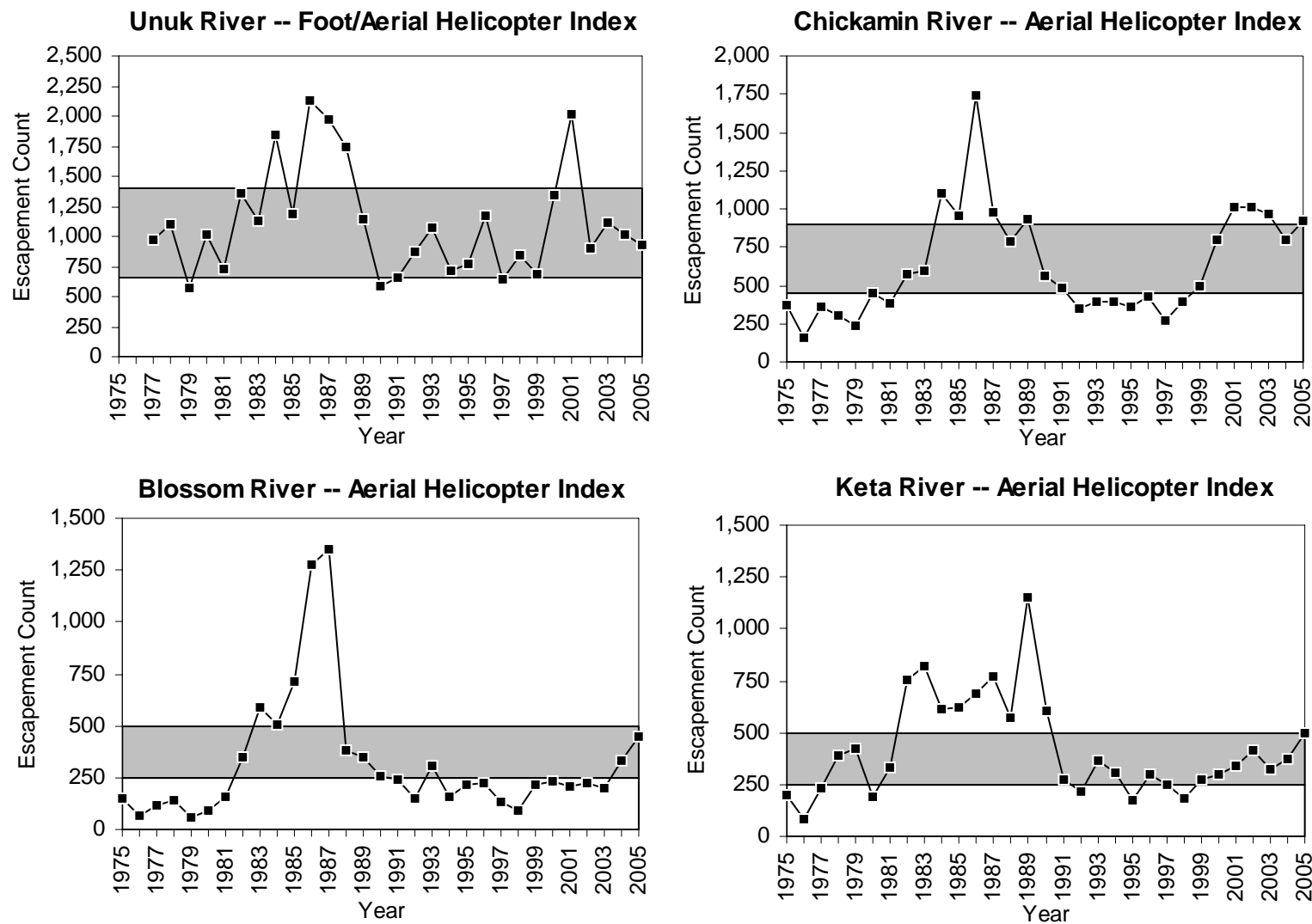
**Figure 1.4**–Peak survey counts of escapements of Chinook salmon in the Unuk, Chickamin, Blossom, and Keta rivers from 1975 to 2005. All values represent the peak survey count of large (3- to 5-ocean-age; ≥ 660 mm MEF) Chinook salmon.

based on a spawner-recruit analysis (McPherson and Carlile 1997), which the Chinook Technical Committee reviewed and accepted. In 1997, ADF&G revised the goal to a range of 650 to 1,400 large index spawners as recommended in the McPherson and Carlile (1997) report and in compliance with the ADF&G Escapement Goal Policy. The Chinook Technical Committee reviewed and accepted this change in 1998 (Appendix 1.8). Harvest data for the 1981 to 1998 brood years are currently being analyzed to determine exploitation and incidental mortality rates for the Unuk River stock. An updated stock-recruit analysis is being developed to revise the existing escapement goal and results will be available by January 2006 (Hendrich *unpublished*).

KETA RIVER

In 1981, ADF&G set the index goal at 500 large fish, based on counts of 500 spawners in 1948 and 462 spawners in 1952 (ADF&G *unpublished*). In 1994, ADF&G revised the escapement goal to 300 large index spawners, based on a spawner-recruit analysis (McPherson and Carlile 1997), which the Chinook Technical Committee reviewed and accepted in 1994. In 1997, ADF&G revised the escapement goal to a range of 250 to 500 large index spawners, in conformance with the McPherson and Carlile (1997) report and in compliance with the ADF&G Escapement Goal Policy. The Chinook Technical Committee reviewed and accepted this change in 1998 (Appendix 1.10). Because coded wire tag data are not available for the Keta River Chinook stock and the Unuk River has the longest time series for such information, harvest and incidental mortality rates from the Unuk River will be used as surrogates in an updated stock-recruit analysis being developed to revise the existing escapement goal. Revised escapement goals for the Keta River Chinook stock will be available by January 2006 (Der Hovanisian et al. *in prep*).

BLOSSOM RIVER

In 1981, ADF&G set an index escapement goal, as a combined count of 800 large fish from the Blossom and Wilson rivers, based on a 1963 count of 825 fish, 450 in the Blossom and 375 in the Wilson. In 1985, the Wilson surveys were dropped for budgetary reasons, but the goal of 800 continued to be applied to the Blossom. In 1994, ADF&G revised the Blossom goal to 300 large index spawners, based on a spawner-recruit analysis (McPherson and Carlile 1997), which the Chinook Technical Committee reviewed and accepted in 1994. In 1997, ADF&G revised the goal to a range of 250 to 500 large index spawners in conformance with the McPherson and Carlile (1997) report and in compliance with the ADF&G Escapement Goal Policy. Because coded wire tag data are not available for the Blossom River Chinook stock and the Unuk River has the longest time series for such information, harvest and incidental mortality rates from the Unuk River will be used as surrogates in an updated stock-recruit analysis being developed to revise the existing escapement goal. Revised escapement goals for the Blossom River Chinook stock will be available by January 2006 (Der Hovanisian et al. *in prep*).

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APPENDICES

Appendix 1.1–Taku River Chinook Salmon Stock

The Taku River, which originates in northwestern British Columbia, produces the largest local population of Chinook salmon on average in Southeast Alaska (McPherson et al. 2000). This spring run is harvested primarily as mature adults from late April to early July on mature adults; immature fish rear primarily outside of the region. Stock assessment includes: coded wire tagging of smolt, estimation of adult escapement (inseason and postseason), harvest, exploitation, smolt abundance and survival.

Outline of stock management, assessment and escapement goal analysis:

Management divisions:	Divisions of Sport Fish and Commercial Fisheries
Management jurisdictions:	ADF&G; joint management ADF&G and CDFO through Pacific Salmon Commission of terminal run
Fisheries:	U.S. recreational, gillnet, troll; Canadian gillnet, First Nations, recreational
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	30,000 to 55,000 range; 35,938 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age) in entire drainage
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Aerial helicopter surveys: 1973 to present, conducted in six major tributaries—the Nahlin, Nakina, Dudidontu, Tatsamenie and Kowatua rivers, and Tseta Creek and standardized since 1973
	Mark–recapture estimates: 1989, 1990, 1995 to present
Index count expansion factor:	5.20 (multiplier for cumulative helicopter peak survey count in five tributaries—Nahlin, Nakina, Dudidontu, Tatsamenie and Kowatua rivers)
Brood years in analysis:	8
Data in analysis:	Estimated total escapement of large female spawners and subsequent smolt production
Data quality:	Good
Contrast in escapements:	NA
Model used for escapement goal:	Empirical observation of optimal smolt production range and associated number of female spawners
Criteria for range:	Highest smolt production
Value of alpha parameter:	4.406
Value of beta parameter:	0.00001643
Document supporting goal:	McPherson, S. A., D. R. Bernard, and J. H. Clark. 2000. Optimal production of Chinook salmon from the Taku River. Alaska Department of Fish and Game, Fishery Manuscript No. 00-2, Anchorage.

Appendix 1.1. Taku River Chinook Salmon Stock

Table 1.1.1–Estimated harvests, escapements, and total runs by year of large Chinook salmon (3- to 5-ocean-age; 5- to 6-year total age) bound for the Taku River, from 1979 to 2005. (2005 data and some recent estimates are subject to revision). Numbers in **bold** are mark-recapture estimates.

		U.S.					Canada					Total		
YEAR	Escapement[a]	Gillnet	Sport	Troll[b]	P.U.	Total	Test Fishery	Gillnet	Sport[c]	Abor.	Total	Harvest	Run	Exp.
1979	21,617	217	1,853	4,850		6,920		73	300		373	7,293	28,910	25.2%
1980	39,239	696	2,512	5,352		8,560		169	300	64	533	9,093	48,332	18.8%
1981	49,559	611	1,703	5,276		7,590		119	300		419	8,009	57,568	13.9%
1982	23,848	847	1,359	2,709		4,915		41	300		341	5,256	29,104	18.1%
1983	9,794	106	1,089	419		1,614		418	300	7	724	2,339	12,133	19.3%
1984	20,778	399	1,210	2,754		4,363		387	300		687	5,049	25,827	19.6%
1985	35,916	802	1,863	749		3,414		263	300	3	566	3,979	39,895	10.0%
1986	38,111	849	755	749		2,353		264	300	8	572	2,925	41,036	7.1%
1987	28,935	557	1,019	399		1,975		175	300		475	2,450	31,385	7.8%
1988	44,524	240	765			1,005	54	557	300	20	877	1,936	46,460	4.2%
1989	**40,329**	933	1,857		62	2,852	23	777	300	5	1,081	3,956	44,285	8.9%
1990	**52,142**	960	2,085		57	3,102	36	1,041	300		1,341	4,479	56,621	7.9%
1991	51,645	1,150	4,199		47	5,396		1,208	300		1,508	6,905	58,550	11.8%
1992	55,889	869	3,334		34	4,237		1,196	300	91	1,587	5,823	61,712	9.4%
1993	66,125	1,823	6,273		17	8,113		1,344	300	19	1,663	9,776	75,901	12.9%
1994	48,368	1,426	3,213		36	4,675		1,727	300	89	2,117	6,791	55,159	12.3%
1995	**33,805**	608	2,225		37	2,870		1,408	300	53	1,761	4,631	38,436	12.0%
1996	**79,019**	1,814	4,602	1,605	87	8,108		2,610	300	47	2,957	11,066	90,085	12.3%
1997	**114,938**	2,197	5,017	1,479	33	8,726		2,114	300	77	2,492	11,218	126,156	8.9%
1998	31,039	278	2,088	650	31	3,047		1,002	300	45	1,347	4,394	35,433	12.4%
1999	**19,734**	785	2,408	804	22	4,019	311	781	300	38	1,119	5,449	25,183	21.6%
2000	**30,529**	426	1,553	1,471	21	3,471	1,312	1,314	300	38	1,651	6,434	36,963	17.4%
2001	**42,980**	538	1,437	1,900		3,875	1,175	1,381	300	94	1,775	6,825	49,805	13.7%
2002	**52,409**	869	2,399	1,519		4,787	1,311	1,463	300	28	1,791	7,889	60,297	13.1%
2003	**36,435**	738	2,017			2,755	1,401	1,350	300	277	1,927	6,083	42,518	14.3%
2004	**68,199**	971	2,700			3,671	1,410	1,777	300	277	2,354	7,435	75,634	9.8%
2005	**36,671**	19,001	3,158			22,159		7,441	300		7,741	29,900	66,571	44.9%
Averages:														
1979-05	43,429	1,508	2,396	2,043	40	5,132	781	1,200	300	49	1,547	6,940	50,369	14.4%
1979-89	32,059	569	1,453	2,584	62	4,142	39	295	300	10	604	4,753	36,812	13.9%
1990-05	51,245	2,153	3,044	1,347	38	5,813	994	1,822	300	78	2,196	8,444	59,689	14.7%

[a] Escapement: escapement estimates shown here are from mark–recapture estimates in 1989 to 1990 and 1995 to 1997 (McPherson et al. 2000), and preliminary mark–recapture estimates for 1999 to 2005. Estimates for 1975 to 1988, 1991 to 1994, and 1998 are expanded survey counts of large spawners. No estimates are available prior to 1973.

[b] Troll harvest estimates are incomplete for 1975 to 1978, 1988 to 1995, and 2003 to 2005 and likely averaged about 1,500 fish per year for incomplete years after 1987.

[c] The sport harvest in Canada is assumed to average 300 fish per year.

Appendix 1.1. Taku River Chinook Salmon Stock

Table 1.1.2–Estimated abundance of females, smolts, subsequent production of adult salmon, and estimated mean fork length for smolts for several year classes of Chinook salmon in the Taku River. Standard errors for ratios (in parentheses) were approximated with the delta method (Seber 1982).

Year class	Females	Smolts	Mean smolt FL (mm)	Smolts female	Recruits	Adult smolt
1975	4,593 (2,139)	1,189,118 (174,197)	79	258.9 (126)	87,450 (23,384)	0.074 (0.0224)
1976	15,165 (6,478)	1,549,052 (374,227)	71	102.1 (50)	65,457 (16,615)	0.042 (0.0148)
1979	10,997 (4,991)	661,150 (97,648)	74	60.1 (29)	39,833 (9,288)	0.060 (0.0166)
1991	27,435 (11,842)	2,098,862 (295,390)	80	76.5 (35)	196,114 (14,153)	0.093 (0.0148)
1992	22,935 (10,391)	1,968,167 (438,569)	73	85.8 (43)	79,307 [a]	0.0403
1993	29,976 (13,573)	1,267,907 (564,432)	78	42.3 (27)	19,114 [b]	0.0151
1994	31,553 (13,565)	1,328,553 (352,068)	76	42.1 (21)		
1995	19,705 (2,644)	1,898,233 (626,335)	77	96.3 (34)		

[a] Estimate is based on final estimate of spawning abundance and preliminary statistics on harvest.

[b] Estimate is based on inputting production of age-1.4 and -1.5 salmon as the average (34% of production) over all age groups for the 1973 to 1991 year classes.

Appendix 1.2–Stikine River Chinook Salmon Stock

The Stikine River is a glacial transboundary river that produces the second largest population of Chinook salmon, on average, in Southeast Alaska (Bernard et al. 2000). These fish are caught incidentally in the troll fishery, a commercial gillnet fishery in U.S. waters near the river, recreational fisheries near Wrangell and Petersburg, and in inriver commercial, aboriginal gillnet, and recreational fisheries in Canada. Stock assessment includes: coded wire tagging of smolt, estimation of adult escapement (inseason and postseason), harvest, exploitation, smolt abundance and survival.

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G, joint management ADF&G and CDFO through Pacific Salmon Commission of terminal run
Fisheries:	U.S. recreational, gillnet, troll; Canadian gillnet, First Nations, recreational
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	14,000 to 28,000 range; 17,368 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age) in entire drainage
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Aerial helicopter surveys: 1975 to present
	Index weir counts, Little Tahltan River: 1985 to present
	Mark–recapture estimates: 1996 to present
Index count expansion factor:	5.15 (multiplier for weir count on Little Tahltan River)
Brood years in analysis:	15 (1977 to 1991)
Data in analysis:	Estimated total escapement of large spawners, all terminal and near terminal harvests, age structure all years
Data quality:	Excellent
Contrast in escapements:	6.3
Model used for escapement goal:	Ricker model incorporating measurement error in escapements and returns
Criteria for range:	S_{MSY} times 0.8 (lower) and 1.6 (upper), per Eggers (1993)
Value of alpha parameter:	2.61
Value of beta parameter:	0.000026592
Document supporting goal:	Bernard, D. R., S. A. McPherson, K. A. Pahlke, and P. Etherton. 2000. Optimal production of Chinook salmon from the Stikine River. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Manuscript No. 00-1, Anchorage.

Table 1.2.1–Escapement index counts, spawning escapement estimates, harvests, run sizes, and exploitation rates for Stikine River Chinook salmon, from 1975 to 2005. Escapement estimates in bold are from mark-recapture estimates (1996 to 2004), estimates in italics (1975 to 1984) are from expansions of aerial counts, and estimates from 1985 to 1995 and 2005 are from expansions of Little Tahltan River weir counts (2005 data and some recent estimates are subject to revision).

Year	Aerial counts	Little Tahltan weir count	Spawning escapement	U.S. sport harvest	U.S. gillnet harvest	Canadian harvest	Total harvest	Total run size	Exploitation Rate
1975	700		*7,571*		1,529	1,202	2,731	10,302	26.5%
1976	400		*5,723*		1,101	1,160	2,261	7,984	28.3%
1977	800		*11,445*		1,378	162	1,540	12,985	11.9%
1978	632		*6,835*	2,282		500	2,782	9,617	28.9%
1979	1,166		*12,610*	1,759	48	1,262	3,069	15,679	19.6%
1980	2,137		*30,573*	2,498	407	2,655	5,560	36,133	15.4%
1981	3,334		*36,057*	2,022	258	1,650	3,930	39,987	9.8%
1982	2,830		*40,488*	2,929	1,032	2,597	6,558	47,046	13.9%
1983	594		*6,424*	2,634	46	2,106	4,786	11,210	42.7%
.1984	1,294		*13,995*	2,171	14	796	2,981	16,976	17.6%
1985	1,598	3,114	16,037	2,953	20	1,491	4,464	20,501	21.8%
1986	1,201	2,891	14,889	2,475	76	3,473	6,024	20,913	28.8%
1987	2,706	4,783	24,632	2,834	94	3,020	5,948	30,580	19.5%
1988	3,796	7,292	37,554	2,440	137	3,333	5,910	43,464	13.6%
1989	2,527	4,715	24,282	2,776	227	3,349	6,352	30,634	20.7%
1990	1,755	4,392	22,619	4,283	308	3,604	8,195	30,814	26.6%
1991	1,768	4,506	23,206	3,657	876	3,258	7,791	30,997	25.1%
1992	3,607	6,627	34,129	3,322	528	3,080	6,930	41,059	16.9%
1993	4,010	11,449	58,962	4,227	866	3,204	8,297	67,259	12.3%
1994	2,422	6,387	33,094	2,140	1,402	2,760	6,302	39,396	16.0%
1995	1,117	3,072	16,784	1,218	945	3,059	5,222	22,006	23.7%
1996	1,920	4,8	**28,949**	2,464	878	3,450	6,792	35,741	19.0%
1997	1,907	5,613,	**26,996**	3,475	1,934	5,019	10,428	37,424	27.9%
1998	1,385	4,879	**25,968**	1,438	157	2,812	4,407	30,375	14.5%
1999	1,379	4,738	**19,947**	3,668	688	5,318	9,674	29,621	32.7%
2000	2,720	6,640	**27,531**	2,581	737	4,684	8,002	35,533	22.5%
2001	4,158	9,738	**63,523**	2,263	7	3,297	5,567	69,090	8.1%
2002	1,131	7,490	**50,875**	3,077	26	4,007	7,110	57,985	12.3%
2003	1,903	6,492	**46,824**	3,252	103	4,739	8,094	54,918	14.7%
2004	6,014	16,381	**48,900**	2,939	5,515	6,743	15,197	64,097	23.7%
2005	1,997	7,387	38,043						

Appendix 1.2. Stikine River Chinook Salmon Stock

Table 1.2.2–Estimated total returns of Stikine River Chinook salmon for brood years 1977 to 2000. (2000 data and some recent estimates are subject to revision). Escapement estimates in bold are from mark-recapture estimates (1996-2000), estimates in italics (1997-1984) are from expansions of aerial counts, and estimates from 1985 to 1995 are from expansions of Little Tahltan River weir counts.

Brood year	Parent escapement	Age-1.2 return	Age-1.3 return	Age-1.4 return	Age-1.5 return	Total return
1977	*11,445*	869	8,217	5,814	154	15,055
1978	*6,835*	1,364	3,909	2,196	151	7,621
1979	*12,610*	4,296	14,394	15,908	313	34,911
1980	*30,573*	1,728	4,063	13,078	1,053	19,923
1981	*36,057*	1,148	6,408	22,261	772	30,588
1982	*40,488*	1,798	6,594	38,133	5,900	52,426
1983	*6,424*	1,830	3,949	13,538	1,595	20,913
1984	*13,995*	1,174	10,838	25,748	979	38,738
1985	16,037	845	2,286	17,213	79	20,423
1986	14,889	3,175	11,437	31,968	1,674	48,254
1987	24,632	2,854	8,712	58,592	3,181	73,339
1988	37,554	812	6,323	31,269	2,350	40,753
1989	24,282	848	4,386	13,185	135	18,554
1990	22,619	1,223	5,045	9,783	167	16,218
1991	23,206	5,101	26,685	28,208	692	60,686
1992	34,129	1,927	9,116	22,283	985	34,311
1993	58,962	1,329	7,197	15,075	544	24,145
1994	33,094	2,437	11,116	13,801	207	27,560
1995	16,784	6,670	18,980	16,061	468	42,179
1996	**28,949**	14,470	52,738	42,750	176	110,134
1997	**26,996**	772	14,686	15,663	133	31,254
1998	**25,968**	5,528	36,062	20,559		
1999	**19,947**	11,325	36,469			
2000	**27,531**	17,499				

Appendix 1.3–Alsek River Chinook Salmon Stock

The Alsek River produces the third or fourth largest Chinook run in Southeast Alaska. Harvest of this stock primarily occurs in U.S. commercial and subsistence set gillnet fisheries in the lower Alsek River in Dry Bay, and in recreational and aboriginal fisheries on the upper Tatshenshini River in Canada. Stock assessment includes: weir counts, direct fishery enumeration, and age, sex, and size sampling.

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	Joint management ADF&G and CDFO through Pacific Salmon Commission
Fisheries:	U.S. subsistence/personal use, gillnet, troll; First Nations, Canadian recreational
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	1,100 to 2,300 range; no point estimate
Population for goal:	Large spawners (3- to 5-ocean-age) counted past the Klukshu River Weir, a clearwater tributary of the Alsek
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Aerial helicopter surveys: 1981 to present
	Index weir counts Klukshu River: 1976 to present
	Mark–recapture estimates for Alsek: 1998 to 2004
Index count expansion factor:	4.95 (multiplier for weir count on Klukshu River)
Brood years in analysis:	16 (1976 to 1991)
Data in analysis:	Estimated total escapement of large spawners, all terminal, near terminal harvests, and age structure all years.
Data quality:	Very good to excellent
Contrast in escapements:	2.9
Model used for escapement goal:	Ricker model and empirical inspection of the spawner-recruit relationship
Criteria for range:	Range producing largest total returns
Value of alpha parameter:	7.44
Value of beta parameter:	0.00081
Document supporting goal:	McPherson, S. A., P. Etherton, and J. H. Clark. 1998. Biological escapement goal for Klukshu River Chinook salmon. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Manuscript 98-2, Anchorage.

Appendix 1.3. Alsek River Chinook Salmon Stock

Table 1.3.1–Spawning escapement, estimated harvests, run size, and exploitation rates for Chinook salmon in Klukshu River, a tributary of Alsek River, from 1976 to 2005. (2005 data and some recent estimates are subject to revision).

| | Klukshu River | | | | | | Alsek River |
Year	Spawning escapement [a]	Total Canada harvest [b]	Total U.S. harvest [c]	Total harvest	Total run size	Exploitation rate	total escapement [d]
1976	1,064	354	154	508	1,572	32%	
1977	2,698	656	421	1,077	3,775	29%	
1978	2,530	656	732	1,388	3,918	35%	
1979	3,104	1,755	758	2,513	5,617	45%	
1980	2,487	290	415	705	3,192	22%	
1981	1,963	430	234	664	2,627	25%	
1982	1,969	633	160	793	2,762	29%	
1983	2,237	518	28	546	2,783	20%	
1984	1,572	415	14	429	2,001	21%	
1985	1,283	322	64	386	1,669	23%	
1986	2,607	218	151	368	2,975	12%	
1987	2,491	476	112	589	3,080	19%	
1988	1,994	312	71	383	2,377	16%	
1989	2,202	486	74	560	2,762	20%	
1990	1,698	722	49	771	2,469	31%	
1991	2,223	822	42	864	3,087	28%	
1992	1,243	253	95	348	1,591	22%	
1993	3,221	332	101	433	3,654	12%	
1994	3,620	500	260	760	4,380	17%	
1995	5,397	1,316	216	1,532	6,929	22%	
1996	3,382	893	249	1,143	4,525	25%	
1997	2,829	437	182	619	3,448	18%	
1998	1,347	286	184	470	1,817	26%	4,621
1999	2,166	349	158	507	2,673	19%	11,597
2000	1,321	114	225	339	1,660	20%	8,295
2001	1,738	189	168	357	2,095	17%	11,022
2002	2,140	235	228	463	2,603	18%	8,504
2003	1,661	175	288	463	2,124	22%	4,932
2004	2,457	165	208	373	2,830	13%	7,343
2005	1,070						
Average	2,219	397	212	609	2,866	20%	8,045

[a] Klukshu River spawning escapement = weir count minus above weir harvest.

[b] Total Canada harvest Klukshu stock = above weir harvest plus 70% Dalton Post sport and 95% Aboriginal Food Fishery.

[c] Total U.S. Harvest of Klukshu stock = 30% Dry Bay commercial, subsistence and personal use gillnet harvest.

[d] Alsek River total escapement from mark–recapture estimates.

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Appendix 1.3. Alsek River Chinook Salmon Stock

Table 1.3.2–Estimated brood year returns of Klukshu River Chinook salmon by age, calculated by using the 30% assumption to apportion U.S. Alsek fishery harvests for brood year 1971 to 1991 (per McPherson et al. 1998a).

Brood year	Estimated escapement	Estimated returns by age					Estimated total return
		Age 3	Age 4	Age 5	Age 6	Age 7	
1971	unknown			498	1,153	0	1,651
1972	unknown		122	1,357	1,235	0	2,714
1973	unknown	0	1,068	2,121	2,414	0	5,603
1974	unknown	43	421	2,655	2,008	73	5,199
1975	unknown	0	412	1,085	1,299	2	2,799
1976	1,064	0	67	813	1,125	0	2,005
1977	2,698	0	276	1,156	696	28	2,156
1978	2,530	0	371	1,941	991	0	3,302
1979	3,104	29	77	739	661	0	1,506
1980	2,487	1	91	812	513	16	1,433
1981	1,963	30	156	1,955	1,086	10	3,238
1982	1,969	16	479	1,656	1,293	6	3,450
1983	2,237	1	196	674	1,329	9	2,209
1984	1,572	2	295	853	768	87	2,006
1985	1,283	10	493	1,265	1,645	2	3,415
1986	2,607	0	246	1,242	871	17	2,376
1987	2,491	4	73	456	1,412	49	1,994
1988	1,994	7	197	1,635	1,461	1	3,301
1989	2,202	47	387	1,514	992	5	2,945
1990	1,698	155	1,279	5,095	1,791		8,320
1991	2,223	11	511	1,773			3,958[a]

Statistics for 1976 to 1990:

Averages	2,127	20	312	1,454	1,109	16	2,911
Minimum	1,064	0	67	456	513	0	1,433
Maximum	3,104	155	1,279	5,095	1,791	87	8,320

[a] Brood year 1991 total return estimated as the average of 58% of total return at age 3 to 5 for brood years 1976 to 1990.

Appendix 1.4. Situk River Chinook Salmon Stock

Table 1.4.1–Weir counts, harvests, run size and exploitation rates for Situk River Chinook salmon, 1976 to 2005. (2005 data and some recent estimates are subject to revision.) The Situk weir count and spawning escapement includes large Chinook (3- to 5-ocean-age), whereas the remainder of the statistics include 2-ocean-age fish as well as large Chinook salmon. One-ocean-age jack males are not included in this table, but annual returns of these fish often number over 1,000.

Year	Situk weir count	Spawning escapement	Sport harvest	Gillnet harvest	Subsistence harvest [a]	Total harvest	Total run size	Exploitation rate
1976	1,421	1,421	200	1,002	41	1,243	3,184	39.0%
1977	1,732	1,732	244	833	24	1,101	2,981	36.9%
1978	808	808	210	382	50	642	1,745	36.8%
1979	1,284	1,284	282	1,028	25	1,335	3,089	43.2%
1980	905	905	353	969	57	1,379	2,504	55.1%
1981	702	702	130	858	62	1,050	1,857	56.5%
1982	434	434	63	248	27	338	949	35.6%
1983	592	592	42	349	50	441	1,290	34.2%
1984	1,726	1,726	146	512	89	747	2,948	25.3%
1985	1,521	1,521	294	484	156	934	2,916	32.0%
1986	2,067	2,067	0	202	99	301	2,873	10.5%
1987	1,379	1,379	75	891	24	990	2,874	34.4%
1988	885	868	185	299	90	574	1,596	36.0%
1989	637	637	0	1	496	497	1,377	36.1%
1990	628	628	0	0	516	516	1,643	31.4%
1991	897	889	88	784	220	1,092	2,095	52.1%
1992	1,618	1,595	172	1,504	341	2,017	3,819	52.8%
1993	980	952	137	790	202	1,129	2,558	44.1%
1994	1,311	1,271	400	2,656	367	3,423	6,085	56.3%
1995	4,700	4,330	1,407	8,107	578	10,092	14,987	67.3%
1996	2,175	1,800	1,529	3,717	559	5,805	8,100	71.7%
1997	2,690	1,878	1,598	2,339	352	4,289	6,601	65.0%
1998	1,353	924	1,156	2,101	594	3,851	5,420	71.1%
1999	1,947	1,461	1,160	3,810	588	5,558	7,208	77.1%
2000	2,518	1,785	1,143	1,318	594	3,055	4,941	61.8%
2001	696	656	75	1,087	402	1,564	2,290	67.1%
2002	1,024	1,000	99	1,078	416	1,593	2,317	67.5%
2003	2,615	2,117	909	2,342	600	3,851	6,267	61.4%
2004	798	757	294 [b]	1,222	396	1,912	2,669	71.6%
2005		613						

[a] Subsistence harvests include 400 fish in 1989, 415 in 1990 and 109 in 1991 taken home during commercial openings in those years with non-retention for Chinook salmon.

[b] Preliminary data from Situk River creel survey.

Table 1.4.2–Estimated total returns of Situk River Chinook salmon for brood years 1977 to 2001. (2001 and some recent estimates are subject to revision).

Brood year	Parent escapement[a]	Age-3 return	Age-4 return	Age-5 return	Age-6 return	Age-7 return	Total return	Return/ spawner
1977	1,732	399	802	199	6	0	1,406	0.81
1978	808	150	438	313	180	29	1,110	1.37
1979	1,284	156	704	1,289	606	0	2,755	2.15
1980	905	268	1,118	895	556	0	2,837	3.13
1981	702	137	1,068	1,019	315	0	2,539	3.62
1982	434	318	973	1,299	439	0	3,029	6.98
1983	592	324	1,181	835	93	0	2,433	4.11
1984	1,726	79	290	441	222	3	1,035	0.60
1985	1,521	35	618	488	68	0	1,209	0.79
1986	2,067	225	396	259	305	4	1,189	0.58
1987	1,379	540	1,267	1,964	314	0	4,085	2.96
1988	868	491	988	904	289	0	2,672	3.08
1989	637	544	821	1,314	79	0	2,758	4.33
1990	628	497	2,366	2,849	461	9	6,182	9.84
1991	889	2,103	11,104	3,089	124	0	16,420	18.47
1992	1,595	934	3,468	2,076	29	0	6,507	4.08
1993	952	1,071	3,014	893	60	0	5,038	5.29
1994	1,271	1,346	2,744	1,034	50	0	5,174	4.07
1995	4,330	1,674	4,570	902	69	0	7,215	1.67
1996	1,800	1,496	3,704	1,301	26	0	6,527	3.63
1997	1,878	284	570	207	42	0	1,103	0.59
1998	924	406	1,204	678	190		*2,478*	
1999	1,461	1,557	4,912	1,322			*7,791*	
2000	1,785	451	1,104				*1,555*	1,785
2001	656	624						

[a] Age-2. and older Chinook salmon.

Appendix 1.4–Situk River Chinook Salmon Stock

The Situk River is a relatively small but productive drainage, located near Yakutat. It usually produces runs of Chinook salmon in the 2,000 to 5,000 fish range, but runs have been as large as 15,000. This stock is primarily exploited in or near the river by commercial set gillnet, subsistence, and recreational fishers. Stock assessment includes: weir counts, direct fishery enumeration for the commercial, subsistence and recreational fisheries, and age, sex and size sampling in the commercial gillnet and recreational fisheries and in the escapement.

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, gillnet, subsistence, troll
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	450 to 1,050 range; 730 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age) in entire drainage
Optimal escapement goal:	None
Inriver goal:	None
Action points:	See Situk River management plan (5 AAC 30.365)
Escapement enumeration:	Weir counts: 1976 to present
Brood years in analysis:	18 (1977 to 1994)
Data in analysis:	Escapement of large spawners, all terminal and near terminal harvests, age structure all years.
Data quality:	Excellent
Contrast in escapements:	4.8
Model used for escapement goal:	Ricker model incorporating correction for autocorrelation seen in the spawner-recruit relationship
Criteria for range:	Range predicted to produce 90% of *MSY*
Value of alpha parameter:	14.806, corrected for autocorrelation
Value of beta parameter:	0.0011135
Document supporting goal:	McPherson, S. A., R. E. Johnson and G. F. Woods. 2005. Optimal Production of Chinook salmon from the Situk River. Alaska Department of Fish and Game, Division of Sport Fisheries, Fishery Manuscript No. 05-04, Anchorage.

Appendix 1.5–Chilkat River Chinook Salmon Stock

The Chilkat River produces the third or fourth largest population of Chinook salmon in Southeast Alaska (Pahlke 2001). Returning adults are present in terminal marine areas from late April through early July. A spring sport fishery occurs annually in Chilkat Inlet and targets mature Chilkat River Chinook salmon. Stock assessment includes: juvenile coded wire tagging, estimation of adult escapement, harvest, exploitation, smolt abundance and survival.

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, subsistence, gillnet, troll
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	1,750 to 3,500 range; point estimate 2,200
Population for goal:	Large spawners (3- to 5-ocean-age)
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Aerial helicopter surveys: 1981 to 1992 (not used and discontinued in 1992 because deemed not representative of population trends in escapement).
	Mark–recapture estimates: 1991 to present
Brood years in analysis:	7 (1991 to 1997)
Data in analysis:	Estimated total escapement of large spawners, all terminal and near terminal harvests, age structure all years.
Data quality:	Very good escapement data, but limited to a short time series and low contrast; harvest and exploitation rate data limited but current coded wire tag program will address this shortfall in the next three to five years.
Contrast in escapements:	2.1 (1991 to 1997)
Model used for escapement goal:	Empirical inspection to determine replacement level and appropriate escapement goal range, supported with Ricker model to estimate replacement level. The optimal escapement level (S_{MSY}) was estimated from the relationship between spawners at replacement and S_{MSY} in 10 other Southeast Alaska Chinook stocks.
Criteria for range:	S_{MSY} times 0.8 (lower) and 1.6 (upper), per Eggers (1993).
Value of alpha parameter:	NA
Value of beta parameter:	NA
Document supporting goal:	Ericksen, R.P., and S.A. McPherson. 2004. Optimal production of Chinook salmon from the Chilkat River. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Manuscript No. 04-01, Anchorage.

Appendix 1.5. Chilkat River Chinook Salmon Stock

Table 1.5.1–Spawning escapement estimates, terminal harvests, terminal run size and exploitation rates for Chilkat River Chinook salmon, from 1991 to 2005. (2005 data and some recent estimates are subject to revision). Escapement estimates are from mark–recapture estimates (1991 to 2005).

Year	Spawning escapement	Subsistence harvest	Sport harvest	D115 Gillnet harvest	Terminal harvest[a]	Terminal run size	Exploitation rate
1991	5,897	0	0	262	262	6,159	0.04
1992	5,284	0	0	129	129	5,413	0.02
1993	4,472	2	314	232	548	5,020	0.11
1994	6,795	10	220	96	326	7,121	0.05
1995	3,790	38	228	41	307	4,097	0.07
1996	4,920	44	354	58	456	5,376	0.08
1997	8,100	18	381	167	566	8,666	0.07
1998	3,675	17	215	177	409	4,084	0.10
1999	2,271	31	184	301	516	2,787	0.19
2000	2,035	34	49	58	141	2,176	0.06
2001	4,517	60	185	71	316	4,833	0.07
2002	4,051	60	337	40	437	4,448	0.10
2003	5,657	46	404	40	490	6,147	0.08
2004	3,422	146	403	295	844	4,266	0.20
2005	3,490						

[a] Chilkat Inlet was closed to all fishing during the springs of 1991 and 1992 because of conservation concerns.

Table 1.5.2–Estimated total returns of Chilkat River Chinook salmon for brood years 1991 to 1997. (1997 data and some recent estimates are subject to revision)

Brood year	Parent escapement	Age-1.2 return	Age-1.3 return	Age-1.4 return	Age-1.5 return	Total return
1991	5,897	1,676	4,613	6,424	219	12,932
1992	5,284	552	2,281	2,628	81	5,542
1993	4,472	222	1,193	1,784	32	3,321
1994	6,795	314	627	704	0	1,645
1995	3,790	592	1,584	2,141	30	4,348
1996	4,920	872	2,969	1,795	41	5,678
1997	8,100	1,047	2,763	4,075	44	7,927

Appendix 1.6–King Salmon River Chinook Salmon Stock

King Salmon River, located on Admiralty Island in northern Southeast Alaska, produces a small run of Chinook salmon (McPherson and Clark 2001). This stock supports no directed fisheries, but is taken incidentally in recreational, drift gillnet, and troll fisheries in marine waters in the region. Stock assessment includes: peak survey counts and age/sex/length escapement sampling.

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, drift gillnet, and troll
Escapement goal type:	*Biological Escapement Goal*
Escapement Goal:	Weir count: 120 to 240 range; 150 point estimate Survey count: 80 to 160 range; 100 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age)
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Aerial helicopter or foot surveys: 1971 to present, standardized over the duration. Weir counts: 1983 to 1992
Index count expansion factor:	1.50 (multiplier for peak survey count)
Brood years in analysis:	21 (1971 to 1991)
Data in analysis:	Estimated total escapement of large spawners, exploitation assumed similar to nearby hatchery stock, age structure 1982 to 1992 extrapolated to all years.
Data quality:	Excellent
Contrast in escapements:	5.7
Model used for escapement goal:	Ricker model
Criteria for range:	S_{MSY} times 0.8 (lower) and 1.6 (upper), per Eggers (1993)
Value of alpha parameter:	7.8
Value of beta parameter:	0.0054
Document supporting goal:	McPherson, S. and J. H. Clark. 2001. Biological escapement goal for King Salmon River Chinook salmon. Alaska Department of Fish and Game, Regional Information Report No. 1J-0140, Juneau.

Appendix 1.6. King Salmon River Chinook Salmon Stock

Table 1.6.1–Escapement index counts, spawning escapement estimates of large spawners, expansion factors, and available age/sex composition for King Salmon River Chinook salmon, from 1971 to 2005. Escapement estimates are from expansions of survey counts in 1971 to 1982 and 1993 to 2005, using an expansion factor of 1.50. Estimates in bold are weir counts.

Year	Survey counts	Spawning escapement	Expansion factor	Age 1.2	Age 1.3	Age 1.4	Age 1.5	Age-.2-.5 total	Large females
1971	94	141							
1972	90	135							
1973	211	317							
1974	104	156							
1975	42	63							
1976	65	98							
1977	134	201							
1978	57	86							
1979	71	132							
1980	70	105							
1981	90	152							
1982	229	389		16	49	344	0	410	279
1983	183	**245**	1.17	**39**	**64**	**142**	**39**	**284**	**172**
1984	184	**265**	1.37	**94**	**47**	**200**	**18**	**359**	**194**
1985	105	**175**	1.57	**32**	**97**	**78**	**0**	**207**	**91**
1986	190	**255**	1.25	**95**	**51**	**204**	**0**	**350**	**175**
1987	128	**196**	1.38	**16**	**78**	**110**	**8**	**212**	**118**
1988	94	**208**	2.02	**14**	**21**	**174**	**7**	**216**	**153**
1989	133	**240**	1.59	**14**	**67**	**156**	**15**	**251**	**156**
1990	98	**179**	1.74	**12**	**87**	**87**	**6**	**191**	**104**
1991	91	**134**	1.38	**0**	**10**	**124**	**0**	**134**	**96**
1992	58	**99**	1.71	**25**	**72**	**27**	**0**	**124**	**44**
1993	175	263							
1994	140	210							
1995	97	146							
1996	192	288							
1997	238	357							
1998	88	132							
1999	200	300		*47*	*125*	*172*	*0*	*344*	*165*
2000	92	137		*36*	*65*	*57*	*4*	*162*	*81*
2001	98	147		*51*	*56*	*65*	*0*	*172*	*65*
2002	102	153		*14*	*96*	*56*	*0*	*166*	*58*
2003	78	117		*62*	*34*	*74*	*0*	*170*	*74*
2004	89	134		*10*	*111*	*12*	*6*	*139*	*49*
2005	94	141							

Appendix 1.7–Andrew Creek Chinook Salmon Stock.

Andrew Creek is a lower drainage and U. S. tributary to the transboundary Stikine River that supports a moderate-sized run of Chinook salmon (Clark et al. 1998). Chinook salmon from Andrew Creek are harvested in the U.S. marine recreational fishery out of Petersburg and Wrangell, and in drift gillnet (primarily Districts 106 and 108) and troll fisheries (regionwide). Stock assessment includes: peak survey counts and age/sex/length escapement sampling.

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, gillnet, and troll
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	650 to 1,500 range; 800 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age); total escapement or expanded survey count.
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Aerial, foot and/or fixed-wing helicopter surveys: 1975 to present, in standardized area and time.
Index count expansion factor:	2.00 (multiplier for peak survey count).
Brood years in analysis:	17 (1975 to 1991)
Data in analysis:	Estimated total escapement of large spawners, assumed annual harvest rates from nearby hatchery stock, age structure measured or inferred from sampled age structure data in eight years.
Data quality:	Good
Contrast in escapements:	5.10
Model used for escapement goal:	Ricker
Criteria for range:	S_{MSY} times 0.8 (lower) and 1.6 (upper), per Eggers (1993)
Value of alpha parameter:	6.07
Value of beta parameter:	0.0008426
Document supporting goal:	Clark, J. H., S. A. McPherson, and D. M. Gaudet. 1998. Biological escapement goal for Andrew Creek Chinook salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 5J98-08, Juneau.

Appendix 1.7. Andrew Creek Chinook Salmon Stock

Table 1.7.1–Escapement peak survey counts, spawning escapement estimates, and expansion factors for Andrew Creek River Chinook salmon, from 1975 to 2005. Escapement estimates are from expansions of survey counts in 1975 and 1985 to 2005, using an expansion factor of 2.0. Estimates in bold are weir counts.

Year	Survey counts	Spawning escapement	Expansion factor	Age 1.2	Age 1.3	Age 1.4	Age 1.5	Age-.2-.5 total	Large females
1975	260	520							
1976		**404**							
1977		**456**							
1978		**388**							
1979	221	**327**	1.48	**74**	**186**	**133**	**11**	**404**	**170**
1980		**282**		**183**	**146**	**136**	**0**	**465**	**146**
1981	300	**536**	1.79	**69**	**314**	**220**	**4**	**607**	**274**
1982	332	**672**	2.02	**49**	**102**	**550**	**18**	**718**	**422**
1983		**366**		**110**	**279**	**81**	**3**	**473**	**168**
1984	154	**389**	2.53	**985**	**242**	**104**	**17**	**1,349**	**182**
1985	319	638							
1986	707	1,414							
1987	788	1,576							
1988	564	1,128							
1989	530	1,060							
1990	664	1,328							
1991	400	800							
1992	778	1,556							
1993	1,060	2,120							
1994	572	1,144							
1995	343	686							
1996	335	670							
1997	293	586		**59**	**248**	**363**	**4**	**674**	**339**
1998	487	974		**330**	**272**	**714**	**22**	**1,338**	**565**
1999	605	1,210		578	504	545	80	1,706	558
2000	690	1,380		193	891	457	12	1,554	831
2001	1,054	2,108		56	917	1,194	12	2,179	1,135
2002	876	1,752		161	475	1,203	35	1,874	1,029
2003	595	1,190		203	648	450	43	1,344	536
2004	1,534	3,068		689	1,540	1,330	53	3,613	1,490
2005	1,015	2,030							

Appendix 1.8–Unuk River Chinook Salmon Stock

Stock Description

The Unuk River originates in northern British Columbia and flows for 129 km where it traverses Misty Fjords National Monument and empties into Burroughs Bay, 85 km northeast of Ketchikan, Alaska. The drainage encompasses approximately 3,885 km^2 (Jones and McPherson 2002), with the lower 39 km flowing through Alaska. In most years, the Unuk River is the fourth or fifth largest producer of Chinook salmon in Southeast Alaska.

Unuk River Chinook salmon are a spring run that produces yearling (age-1) fish almost exclusively. Juvenile coded wire tagging studies indicate that the majority of Chinook salmon rear in the U.S. portion of the river. Survey counts of large Chinook salmon have been made on the Unuk River since 1977. Indices of escapement on the Unuk River are determined annually by summing the peak observer aerial and foot survey counts of large spawners seen in six tributaries: Cripple, Gene's Lake, Kerr, Clear, and Lake creeks plus the Eulachon River (Pahlke 2001).

Several consecutive years of low survey counts in the early 1990s generated concern for the health of the Unuk River Chinook salmon stock. In response, the Division of Sport Fish began a full stock assessment program on the Unuk River to estimate smolt production, escapement, total run size, exploitation rates, harvest distribution, overwinter survival, and marine survival. In 1994, mark–recapture and radio telemetry studies were conducted, and mark–recapture studies have occurred since 1997.

Coded wire tagging studies on the 1982 to 1986 (Pahlke 1995) and on the 1992 to present brood years indicate that harvest rates for Unuk River Chinook salmon (age-1.1 to 1.5) average about 17% in landed catch. This information, coupled with similar data on Chinook salmon from the nearby Chickamin River, provide strong evidence that Unuk River fish are mostly *inside rearing* in nature, but a few recoveries have been recorded as far north as Kodiak and several coded wire tags each year are recovered in northern British Columbia fisheries in Canada.

The current stock assessment program for adult Chinook salmon returning to the Unuk River has three primary goals: (1) to estimate escapement; (2) to estimate age, sex, and length distribution in the escapement; and (3) to sample escapement for the fraction of fish possessing coded wire tags by brood year. The results are essential to estimate the marked fraction of each brood for coded wire tagged fish and to estimate harvest of this stock in current and future sport and commercial fisheries. These harvest and escapement data will enable us to estimate total run size, exploitation rates, harvest distribution, and marine survival for this important Chinook salmon indicator stock in southern Southeast Alaska.

Escapements over the past 5 years of estimates (2001 to 2005) have averaged 6,305 total large spawners, and 1,195 large spawners in peak survey counts (Table 1.3). All five of these escapements were within or above the current (1997) goal range (Figure 1.4). Our most current spawner-recruit data are summarized in Tables 1.8.1 and 1.8.2. The ADF&G is in the process of analyzing these data and will provide an escapement goal for total large spawners, as measured in the annual mark-recapture program, by January 2006 (Hendrich *unpublished*).

Appendix 1.8. Unuk River Chinook Salmon Stock

System:	Unuk River
Species:	Chinook salmon

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, gillnet, and troll
Escapement goal type:	*Biological Escapement Goal*
Current escapement goal:	650 to 1,400; 800 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age) as counted in **peak survey counts** in the standardized survey areas on six clear water tributaries: Eulachon River and Clear, Lake, Kerr, Genes Lake and Cripple Creeks.
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Helicopter and foot peak survey counts: 1977 to present in standard time and areas on: Eulachon River and Clear, Lake, Kerr, Genes Lake and Cripple Creeks.
	Mark–recapture estimates: 1994, 1997 to present
Index count expansion factor in revision analysis:	4.83 (multiplier for the sum of peak survey counts)
Brood years in revision analysis:	22 (1977 to 1998)
Data in revision analysis:	Survey counts, expanded by 4.8:1 , and mark-recapture estimates of the total escapement of large spawners,
	marine harvest by age for 12 wild broods with average harvest data for the remainder, age structure sampled directly in most years, estimated for all broods.
Data quality:	Good to excellent
Contrast in escapements:	Hendrich *unpublished*
Model used for escapement goal:	Hendrich *unpublished*
Criteria for range:	Hendrich *unpublished*
Value of alpha parameter:	Hendrich *unpublished*
Value of beta parameter:	Hendrich *unpublished*
Document supporting current goal:	McPherson, S. A. and J. Carlile. 1997. Spawner-recruit analysis of Behm Canal Chinook salmon stocks. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report 1J97-06, Juneau.
	Additional comments: The ADF&G is in the process of analyzing the additional spawner-recruit data for this stock and plans to provide a revised escapement goal by January 2006 (Hendrich *unpublished)*.

Appendix 1.8. Unuk River Chinook Salmon Stock

Table 1.8.1–Escapement survey counts, spawning escapement estimates of large spawners, and available age/sex composition for Unuk River Chinook salmon, from 1977 to 2005. Escapement estimates in bold are from mark–recapture studies, the remainder are from expanded survey counts. (2005 data and some recent estimates are subject to revision).

Year	Survey count	Spawning Escapement[a]	Age 1.2	Age 1.3	Age 1.4	Age 1.5	Age-.2-.5 total	Large females
1977	974	4,706						
1978	1,106	5,344						
1979	576	2,783						
1980	1,016	4,909						
1981	731	3,532						
1982	1,351	6,528	225	1,031	5,497	0	6,753	3,779
1983	1,125	5,436						
1984	1,837	8,876	1,041	6,026	2,918	0	9,986	4,985
1985	1,184	5,721	3,103	4,819	660	0	8,582	4,181
1986	2,126	10,273	7,132	5,123	4,800	92	17,147	6,757
1987	1,973	9,533	2,011	4,578	4,261	50	10,900	5,741
1988	1,746	8,437	1,293	3,358	4,433	64	9,148	3,856
1989	1,149	5,552	337	2,544	2,721	80	5,682	3,393
1990	591	2,856	1,509	707	1,526	145	3,887	1,624
1991	655	3,165	786	2,414	551	38	3,789	1,369
1992	874	4,233	1,319	1,914	2,232	30	5,496	2,836
1993	1,068	5,160	568	2,241	2,797	99	5,704	2,818
1994[b]	711	3,435	1,044	1,382	2,124	122	4,673	2,039
1995	772	3,730	1,616	995	2,362	0	4,974	1,989
1996	1,167	5,639	736	3,061	2,319	187	6,303	2,661
1997	636	**2,970**	**916**	**1,240**	**1,408**	**59**	**3,623**	**1,658**
1998	840	**4,132**	**1,269**	**2,595**	**1,207**	**35**	**5,106**	**2,087**
1999	680	**3,914**	**2,427**	**1,918**	**1,581**	**16**	**5,942**	**1,998**
2000	1,341	**5,872**	**3,140**	**3,499**	**1,447**	**50**	**8,136**	**2,506**
2001	2,019	**10,541**	**946**	**6,923**	**3,337**	**21**	**11,227**	**5,697**
2002	897	**6,988**	**2,485**	**2,887**	**3,188**	**66**	**8,626**	**3,330**
2003	1,121	**5,546**	**592**	**3,942**	**1,474**	**46**	**6,054**	**2,874**
2004	1,008	**3,963**	**2,936**	**1,289**	**1,756**	**19**	**6,000**	**1,645**
2005	929	4,487						

[a] The expansion factor 4.83 (SE = 0.59), based on the 1997-2001 and 2003-2004 mark-recapture estimates, was used to convert survey counts to total escapement of large spawners for years prior to 1997.

[b] A mark-recapture experiment was conducted in 1994 to estimate escapement, but the data were biased. The expanded survey count was used for the revised goal analysis.

Appendix 1.8. Unuk River Chinook Salmon Stock

Table 1.8.2–Estimated parent escapements, harvests, total returns, and exploitation rates of Unuk River Chinook salmon for brood years 1981 to 1998. Estimates for escapement data in bold are from mark–recapture studies, the remainder are from expanded survey counts.

Brood year	Parent escapement	Inriver total return[a]	Marine harvest (landed catch)	Incidental mortality	Total return[b]	Return/ spawner[b,c]	Exploitation rate[b]
1981[d]	3,532	12,552	2,207	628	15,387	4.4	18.4%
1982	6,528	16,223	1,895	1,007	19,124	2.9	15.2%
1983	5,436	8,235	870	350	9,455	1.7	12.9%
1984	8,876	5,401	315	187	5,904	0.7	8.5%
1985	5,721	1,626	367	182	2,174	0.4	25.2%
1986	10,273	6,254	1,192	646	8,092	0.8	22.7%
1987[d]	9,533	5,619	988	281	6,889	0.7	18.4%
1988[d]	8,437	5,684	999	284	6,968	0.8	18.4%
1989[d]	5,552	4,500	791	225	5,517	1.0	18.4%
1990[d]	2,856	4,417	777	221	5,415	1.9	18.4%
1991[d]	3,165	6,121	1,076	306	7,503	2.4	18.4%
1992	4,223	3,199	252	89	3,540	0.8	9.6%
1993	5,160	**5,142**	1,084	315	6,541	1.3	21.4%
1994[e]	3,435	4,655	840	241	5,737	1.7	18.9%
1995	3,730	**9,329**	1,730	549	11,608	3.1	19.6%
1996	5,639	**13,297**	1,992	629	15,918	2.8	16.5%
1997	**2,970**	**5,326**	982	205	6,513	2.2	18.2%
1998	**4,132**	**8,183**	1,200	353	9,736	2.4	16.0%

[a] Inriver total returns include 2- to 5-ocean-age fish (total age 4 to 7 years).

[b] Total returns, return per spawner, and exploitation rate all include incidental mortalities.

[c] Expressed in terms of the number of large fish per 2- to 5-ocean-age spawner.

[d] No wild stock CWT data for years 1981 and 1987-1991. Marine harvest and incidental mortality were calculated using the average brood year exploitation and incidental mortality rates from years 1993-1998.

[e] A mark-recapture experiment was conducted in 1994 to estimate escapement, but the data were biased. The expanded survey count was used for the revised goal analysis.

Appendix 1.9–Chickamin River Chinook Salmon Stock.

The Chickamin River produces between 5,000 to 10,000 Chinook salmon annually. Harvest is spread throughout the fisheries of southern and central Southeast Alaska, with occasional recoveries in outside waters as far north as Prince William Sound and as far south as northern British Columbia. Stock assessment includes: peak survey counts and age/sex/length data escapement sampling

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, gillnet, and troll
Escapement goal type:	*Biological Escapement Goal*
Escapement goal:	450 to 900 range; 525 point estimate
Population for goal:	Large spawners (3- to 5-ocean-age) as counted in **peak survey counts** in the standardized survey areas on eight clearwater tributaries: South Fork, Barrier, Butler, Leduc, Indian, Humpy, King, and Clear Falls.
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	Helicopter and foot peak survey counts: 1975 to present in standard time and areas on: South Fork, Barrier, Butler, Leduc, Indian, Humpy, King and Clear Falls tributaries.
	Mark–recapture estimates: 1995 to 1996, and 2001 to 2003
Index count expansion factor:	4.64 (multiplier for the sum of peak survey counts)
Brood years in analysis:	15 (1975 to 1989), as in McPherson and Carlile (1997).
Data in analysis:	Survey counts, expanded by 4:1 and 6.7:1 to estimate total escapement of large spawners, marine harvest by age for five wild broods with adjusted hatchery harvest data for the remainder, age structure estimated directly in about half of the years, estimated for all broods.
Data quality:	Fair, McPherson and Carlile (1997)
Contrast in escapements:	11.1, McPherson and Carlile (1997)
Model used for escapement goal:	Ricker model
Criteria for range:	S_{MSY} times 0.8 (lower) and 1.6 (upper), per Eggers (1993)
Value of alpha parameter:	7.46
Value of beta parameter:	0.0003446
Document supporting goal:	McPherson, S. A. and J. Carlile. 1997. Spawner-recruit analysis of Behm Canal Chinook salmon stocks. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report 1J97-06, Juneau.

Appendix 1.9. Chickamin River Chinook Salmon Stock

Table 1.9.1–Escapement survey counts, spawning escapement estimates of large spawners, expansion factors and available age/sex composition for Chickamin River Chinook salmon, from 1975 to 2005. (2005 data and some recent estimates are subject to revision). Escapement estimates in bold are from mark–recapture studies, the remainder are from expanded survey counts.

Year	Survey count	Spawning escapement	Expansion factor [a]	Age 1.2	Age 1.3	Age 1.4	Age 1.5	Age-.2-.5 total	Large females
1975	370	1,717							
1976	157	727							
1977	363	1,682							
1978	308	1,431							
1979	239	1,107							
1980	445	2,063							
1981	384	1,782							
1982	571	2,649							
1983	599	2,781							
1984	1,102	5,113							
1985	956	4,436		1,143	2,906	1,224	0	5,273	2,345
1986	1,745	8,097		1,204	5,736	2,397	0	9,336	4,470
1987	975	4,524		1,893	2,778	1,490	55	6,216	2,841
1988	786	3,647		539	2,183	1,547	44	4,314	1,768
1989	934	4,334		300	1,663	2,441	249	4,653	3,014
1990	564	2,617		688	593	1,738	102	3,120	1,840
1991	487	2,260		784	2,279	253	17	3,333	NE
1992	346	1,605		555	905	551	8	2,019	NE
1993	389	1,805		302	1,242	665	19	2,228	NE
1994	388	1,800		277	902	873	36	2,089	NE
1995	356	**2,309**	6.5	**274**	**416**	**1,219**	**57**	**1,966**	**980**
1996	422	**1,587**	3.8	**214**	**992**	**527**	**46**	**1,779**	**890**
1997	272	1,262		269	652	454	28	1,404	666
1998	391	1,814		534	1,601	213	0	2,348	960
1999	492	2,283		600	1,094	779	14	2,487	1,107
2000	801	3,717		972	2,146	1,034	0	4,152	1,749
2001	1,010	**5,177**	5.1	**1,080**	**3,778**	**1,190**	**32**	**6,080**	**2,841**
2002	1,013	**5,007**	4.9	**1,648**	**2,214**	**1,722**	**25**	**5,610**	**2,285**
2003	964	**4,579**	4.8	**555**	**3,371**	**1,145**	**21**	**5,092**	**2,550**
2004	798	**3,275**	4.1	**2,077**	**969**	**1,396**	**16**	**4,458**	**1,357**
2005	924	4,287							

[a] The expansion factor is 4.64 (SE=0.61) to convert peak survey counts to total escapement of large spawners, based on the 1995 to 1996 and 2001 to 2003 mark–recapture estimates.

Appendix 1.10–Keta River Chinook Salmon Stock.

Stock Description

The Keta River enters Boca de Quadra Inlet in the Misty Fjords National Monument about 75 km east of Ketchikan, Alaska. The Keta River produces a small run of Chinook salmon representing about 1% of the wild stock production in Southeast Alaska. Like other Chinook salmon found in the region, these fish are a spring run. This stock produces yearling (age-1.) smolt primarily with about 10% subyearling fish (age-0.). Information inferred from coded wire tagging studies in the nearby Chickamin and Unuk rivers suggests that Keta River Chinook salmon are *inside rearing* in behavior, spending most of their lives in Southeast Alaska and perhaps northern British Columbia. Keta River Chinook salmon are very robust, attaining lengths and weights rarely seen elsewhere in the region. The Keta River itself has many exposed gravel bars with intermittent large pools and logjams. This river is typified by large sediments, probably the result of extremely high flows common to the system. Habitats of this nature are suited for the larger, more robust fish common to the Keta River.

This river is one of four Behm Canal index systems in which Chinook are counted annually (Pahlke 2001). Peak counts of Chinook salmon in the Keta River have increased from the average seen during the base period (1975 to 1980), and in recent years have steadily increased towards the upper end of the current *biological escapement goal* range (Figure 1.4). Temporal trends in Chinook salmon abundance are reasonably consistent among the four Behm Canal index systems. In general, counts were at or above escapement goal ranges for most of the 1980s, but a significant downward trend began for all four systems near the end of the decade. Although this decline is apparent for the Keta River, counts have been near or above the lower end of the range since 1990. In recent years, escapements have been about double the values seen during the base years.

The ADF&G Division of Sport Fish performed three mark–recapture studies from 1998 to 2000 to estimate Chinook salmon escapement in the Keta River (Brownlee et al. 1999; Freeman et al. 2001). The estimated escapement of large Chinook salmon in 2000 was 913, about the same as the 968 estimated in 1999, and up from the 446 estimated in 1998. Expansion factors for the peak aerial survey counts were 3.0 in 2000, 2.5 in 1998 and 3.5 in 1999. The expansion factor used to expand index counts to estimates of total escapement is 3.0, the mean value seen during the three years of mark–recapture study (Table 1.10.1).

Escapements over the past 5 years of estimates (2001 to 2005) have averaged 1,169 total large spawners, and 390 large spawners in peak survey counts (Table 1.3). All five of these escapements were within or above the current (1997) goal range (Figure 1.4). Our most current spawner-recruit data are summarized in Table 1.10.1. The ADF&G is in the process of analyzing these data and will provide an escapement goal for large spawners, as measured in the annual survey program, by January 2006 (Der Hovanisian et al. *in prep*).

System: Keta River

Species: Chinook salmon

Outline of stock management, assessment and escapement goal analysis

Management division: Sport and Commercial Fisheries Divisions

Management jurisdictions: ADF&G

Fisheries: U.S. recreational, gillnet, and troll; non directed

Escapement goal type: *Biological Escapement Goal*

Current escapement goal: 250 to 500 range; 300 point estimate

Population for goal: Large spawners ($\geq$ 660 mm MEF, or 2- to 5-ocean-age) as counted in **peak survey counts** under standardized survey conditions (time and area).

Optimal escapement goal: None

Inriver goal: None

Action points: None

Escapement enumeration: Aerial helicopter surveys: 1975 to present, standardized by time and area.

                                        Mark–recapture estimates: 1998 to 2000

Index count expansion factor
in revision analysis: 3.0: multiplier for helicopter peak survey count in the standardized survey area on the Keta River.

Brood years in revision analysis: 24 (1975 to 1998)

Data in revision analysis: Survey counts, expanded by 3.0:1 to estimate total escapement of large spawners, harvest rates assumed from Unuk, age structure limited, but estimated for all broods.

Data quality: Fair

Contrast in escapements: Der Hovanisian et al. *in prep*

Model used for escapement goal: Der Hovanisian et al. *in prep*

Criteria for range: Der Hovanisian et al. *in prep*

Value of alpha parameter: Der Hovanisian et al. *in prep*

Value of beta parameter: Der Hovanisian et al. *in prep*

Document supporting current goal: McPherson, S. A. and J. Carlile. 1997. Spawner-recruit analysis of Behm Canal Chinook salmon stocks. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report 1J97-06, Juneau.

                                        Additional comments: The ADF&G is in the process of analyzing the additional spawner-recruit data for this stock and plans to provide a revised escapement goal by January 2006 (Der Hovanisian et al. *in prep*).

Table 1.10.1–Escapement survey counts, spawning escapement estimates of large spawners, expansion factors, and available age/sex composition for Keta River Chinook salmon, from 1975 to 2005. (2005 data and some recent estimates are subject to revision). Escapement estimates in bold are from mark–recapture studies, the remainder are from expanded survey counts.

Year	Survey count	Spawning escapement	Expansion factor [a]	Total age 3	Total age 4	Total age 5	Total age 6	Large females
1975	203	609						
1976	84	252						
1977	230	690						
1978	392	1,176						
1979	426	1,278						
1980	192	576						
1981	329	987						
1982	754	2,262						
1983	822	2,466						
1984	610	1,830						
1985	624	1,872						
1986	690	2,070						
1987	768	2,304						
1988	575	1,725						
1989	1,155	3,465						
1990	606	1,818						
1991	272	816						
1992	217	651						
1993	362	1,086						
1994	306	918						
1995	175	525						
1996	297	891						
1997	246	738						
1998	180	**446**	2.5	**0**	**55**	**151**	**234**	**240**
1999	276	**968**	3.5	**13**	**320**	**509**	**126**	**390**
2000	300	**914**	3.0	**12**	**318**	**378**	**206**	**377**
2001	343	1,029		31	217	704	78	464
2002	411	1,233		0	317	523	393	464
2003	322	966		0	186	610	169	390
2004	376	1,128		27	385	358	358	464
2005	497	1,491						

a The expansion factor is 3.00 (SE = 0.52) to convert peak survey counts to total escapement of large spawners, based on the 1998 to 2000 mark–recapture estimates.

Appendix 1.11–Blossom River Chinook Salmon Stock

Stock Description

The Blossom River is a clearwater river on the mainland in southern Southeast Alaska, approximately 40 miles east of Ketchikan. Chinook salmon from the Blossom River, along with fish from the Keta, Unuk, and Chickamin rivers are collectively known as the Behm Canal stocks, named for the long narrow body of water that they all flow into.

Chinook spawn in the main channel of the river. They start to enter the river in late June and complete spawning by early September. The stock produces primarily yearling smolt (age-1.), but returns have comprised as much as 15% subyearling fish (age-0.), which is unusual in Southeast Alaska (Pahlke 2001). The only other stocks which produce subyearling smolt, to any degree, are the Keta River stock and those in the Yakutat Forelands area, such as the Situk River. Based on coded wire tagging of Unuk and Chickamin Chinook wild and hatchery stocks, we believe the ocean distribution of this stock is primarily in Southeast Alaska waters and to a lesser extent in northern British Columbia.

The stock assessment program for the Blossom River stock consisted solely of standardized helicopter surveys from 1975 to 1998 (Pahlke 2001). In 1998, ADF&G received special funding from the U.S. Congress to improve abundance-based management for Chinook salmon in the Pacific Salmon Treaty area. ADF&G directed a portion of the money received to improving stock assessment by addressing the lack of information of Southeast Alaska Chinook stocks. Those funds and monies secured through the Pacific Coastal Salmon Recovery Fund program have been used to collect age, sex, and size information and estimate total on the Blossom, Keta, and Chickamin rivers in specific years since 1998. Annual surveys of escapement have continued in the Blossom River. A mark–recapture tagging experiment was conducted in 1998, which provided the current expansion factor of 4.0, i.e., 25% of the total escapement of large spawners is counted in the helicopter surveys (Brownlee et al. 1999). Mark-recapture experiments were also conducted in 2004 and 2005, but variability of the mean expansion factor exceeded data standards developed by the Chinook Technical Committee (coefficient of variation greater than 20%). Funding is being sought to conduct a fourth mark-recapture experiment in 2006.

We have sampled the escapement for age, sex, and size data since 1998. The age data indicate that returns of large Chinook salmon in this stock are composed 2-, 3- and 4-ocean-age fish (Pahlke 2001). The 2-ocean fish (primarily 4-year-old total age) are larger than Chinook salmon in most other systems (but similar to the Chickamin and Keta), and about 75% of the 2-ocean-age spawners in the Blossom River are of legal size. We have also found that the Chickamin, Keta, and Blossom River stocks produce the largest Chinook salmon at age in the region.

Survey counts have been relatively stable since 1975, with the exception of three years (Figure 1.4). Survey counts were the lowest in the period from 1975 to 1980, rose for a few years to unprecedented levels, and then have been relatively stable since 1989. The high counts from 1985 to 1987 are the result of an exceptionally high survival from one particular brood, a phenomenon that has occurred at least once in the last 28 years for most Southeast Alaska Chinook stocks. The 2001 to 2005 average survey count was 282 large Chinook, which is about three times the average escapement counts (102 large Chinook) from 1975 to 1980, the base period used by the Pacific Salmon Commission.

As mentioned in the body of the report above, a *biological escapement goal* range was established in 1997 for the Blossom River stock, based on limited data through the 1989 brood year (calendar year data through 1995). That escapement goal range was a survey count of 250 to 500 large spawners. Escapements in the Blossom River meet the 1997 *biological escapement goal* in 2004 and 2005.

The 1997 escapement goals were established prior to gathering new stock assessment data for Behm Canal Chinook salmon stocks. Preliminary analyses indicate that the existing goal overestimates the escapement level that will provide maximum sustained yield for this stock. Our most current spawner-recruit data are summarized in Table 1.11.1. The ADF&G will continue to analyze these data and will provide an escapement goal for large spawners, as measured in the annual survey program, by January 2006 (Der Hovanisian et al. *in prep*).

Appendix 1.11. Blossom River Chinook Salmon Stock

System: Blossom River

Species: Chinook salmon

Outline of stock management, assessment and escapement goal analysis

Management division:	Sport and Commercial Fisheries Divisions
Management jurisdictions:	ADF&G
Fisheries:	U.S. recreational, gillnet, and troll; non directed
Escapement goal type:	*Biological Escapement Goal*
Current escapement goal:	250 to 500 range; 300 point estimate
Population for goal:	Large spawners ($\geq$ 660 mm MEF, or 2- to 5-ocean-age) as counted in **peak survey counts** under standardized survey conditions (time and area).
Optimal escapement goal:	None
Inriver goal:	None
Action points:	None
Escapement enumeration:	<u>Aerial helicopter surveys</u>: 1975 to present, standardized by time and area.
	<u>Mark–recapture estimate</u>: 1998 and 2003-2005
Index count expansion factor: revision analysis	4.0: multiplier for helicopter peak survey count, based on one year (1998).
Brood years in revision analysis:	24 (1975 to 1998)
Data in revision analysis:	Survey counts, expanded by 4.0:1 to estimate total escapement of large spawners, harvest rates assumed from Unuk, age structure limited, but estimated for all broods.
Data quality:	Fair
Contrast in escapements:	Der Hovanisian et al. *in prep*
Model used for escapement goal:	Der Hovanisian et al. *in prep*
Criteria for range:	Der Hovanisian et al. *in prep*
Value of alpha parameter:	Der Hovanisian et al. *in prep*
Value of beta parameter:	Der Hovanisian et al. *in prep*
Document supporting current goal:	McPherson, S. A. and J. Carlile. 1997. Spawner-recruit analysis of Behm Canal Chinook salmon stocks. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report 1J97-06, Juneau.
	Additional comments: The ADF&G is in the process of analyzing the additional spawner-recruit data for this stock and plans to provide a revised escapement goal by January 2006 (Der Hovanisian et al. *in prep*).

Appendix 1.11. Blossom River Chinook Salmon Stock

Table 1.11.1–Escapement index counts and spawning escapement estimates for large spawners, expansion factors, and available age/sex composition for the Blossom River Chinook salmon population, from 1975 to 2005. (2005 data and some recent estimates are subject to revision). Escapement estimates are from expansions of aerial survey counts from 1975 to 1997 and 1999 to 2003, using the 1998 expansion factor of 4.0. Numbers in bold are mark-recapture estimates.

Year	Survey counts	Spawning escapement	Expansion factor[a]	Total age 3	Total age 4	Total age 5	Total age 6	Large females
1975	146	584						
1976	68	272						
1977	112	448						
1978	143	572						
1979	54	216						
1980	89	356						
1981	159	636						
1982	345	1,380						
1983	589	2,356						
1984	508	2,032						
1985	709	2,836						
1986	1,278	5,112						
1987	1,349	5,396						
1988	384	1,536						
1989	344	1,376						
1990	257	1,028						
1991	239	956						
1992	150	600						
1993	303	1,212						
1994	161	644						
1995	217	868						
1996	220	880						
1997	132	528						
1998	**91**	**364**	4.0	**0**	**70**	**143**	**144**	**180**
1999	212	848		848	353	354	71	283
2000	231	924		12	318	378	206	377
2001	204	816		0	272	317	227	544
2002	224	896		0	151	477	268	500
2003	203	812		0	90	451	271	511
2004	333	**734**	2.2	**18**	**257**	**295**	**164**	**247**
2005	445	**912**	2.0	**9**	**199**	**560**	**140**	**369**

[a] Based on an expansion factor of 4.0 observed in 1998.